

# REGULATED DC POWER SUPPLY

PE 1642 (9415 016 42001)

PE 1644 (9415 016 44001)

PE 1646 (9415 016 46001)

PE 1648 (9415 016 48001)

OPERATING MANUAL — Page 2

BEDIENUNGSANLEITUNG — Seite 10

NOTICE D'EMPLOI — page 18



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# PHILIPS

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## ABBREVIATIONS

BW	Bandwidth
$f_m$	Mains frequency
G	External supply
$I_m$	Mains current
$I_o$	Output current
M-S	Master-Slave
OVP	Overvoltage protection
PARD	Periodic and random deviation
$P_o$	Output power
p-p	Peak-to-peak value
RH	Relative humidity
r.m.s.	Root mean square value
$R_p$	Programming resistor
$U_m$	Mains voltage
$U_o$	Output voltage
$U_p$	Programming voltage



# PHILIPS

## Service Information

Advanced Automation Systems  
Audio-communications  
Broadcast Equipment  
Electronic Security & Recording Systems  
Industrial Automation  
Scientific & Analytical Equipment  
Test and Measurement

Industrial &  
Electro-acoustic  
Systems  
Division

860911

POWER SUPPLIES

SERVICE INFORMATION N° 106

PE 1642 - 1644 - 1646 - 1648 : 400 W  
BENCH-MODELS POWER SUPPLIES

SERVICE MANUAL : 9499 165 00611 OR 4822 872 45003

CONC. : INFORMATIONS ABOUT THE THREE DIFFERENT TYPES OF METERS USED IN THESE  
POWER SUPPLIES

# ANNEXE SERVICE INFORMATION N° 106

FRONT VIEW

METER TYPES :

REAR VIEW

ORDERING NUMBERS

PE 1642/00

P1 : VOLTMETER 20 V : 5322 344 64106

P2 : AMMETER 20 A : 5322 344 64107

TEXT PLATES : GREY : 5322 455 61004  
BROWN : 5322 455 61024

5322 344 60007

5322 344 60049

5322 344 60074

5322 344 60115

PE 1644/00

P1 : VOLTMETER 40 V : 5322 344 64105

P2 : AMMETER 10 A : 5322 344 64104

TEXT PLATES : GREY : 5322 455 61001  
BROWN : 5322 455 61022

5322 344 60014

5322 344 60015

5322 344 60075

5322 344 60114

PE 1646/00

P1 : VOLTMETER 75 V : 5322 344 64119

P2 : AMMETER 6 A : 5322 344 64121

TEXT PLATES : GREY : 5322 455 61003  
BROWN : 5322 455 61023

5322 344 60011

5322 344 60016

5322 344 60076

5322 344 64121

PE 1648/00

P1 : VOLTMETER 150V : 5322 344 64108

P2 : AMMETER 3 A : 5322 344 64109

TEXT PLATES : GREY : 5322 455 61002  
BROWN : 5322 455 61032

5322 344 60009

5322 344 60008

5322 344 60077

5322 344 60113

NOTE : B and C meter types must be used with new front wall : 5322 447 90381

## GENERAL INFORMATION

### \* Unpacking

On delivery, check the power supply as soon as possible to ascertain whether any damage has occurred in transit. Retain all packing materials until all items of the power supply have been accounted for and checked.

### \* Visual Inspection

Carry out a mechanical check on e.g. connectors, terminal blocks, external fuseholders and other enclosures. Check items for dents, chips or other signs of damage. Check if all accessories are present in accordance with the accessories list (see Section 2.4.)

### \* Claims

In the event of obvious damage or shortages, or if the safety of the power supply is suspect, a claim should be filed with the carrier immediately. A PHILIPS Sales or Service organisation should also be notified in order to facilitate the repair of the instrument.

### \* Note

Do not connect the power supply to the mains until it has been checked by a skilled technician.

## GENERAL

### 1. INTRODUCTION

The PE 1642, PE 1644, PE 1646 and PE 1648 are 400 W stabilised d.c. power supplies, which provide maximum output when convection cooling is used and the ambient temperature is lower than 40°C. The power supplies are intended for 19-inch rack-mounting but can be adapted for use as free-standing versions.

Optimum efficiency is obtained by means of a thyristor pre-regulator and the transistor series-regulator gives good control and stability with minimum ripple.

The output voltage, current and the overvoltage protection can be continuously adjusted.

Several instruments may be series or parallel connected. Other facilities include: remote sensing, "master-slave" series or parallel operation, remote ON-OFF, voltage and current programming, crowbar protection.

**NOTE:** The design of this power supply is subject to development and improvement. Consequently, this power supply may incorporate minor changes with respect to the information contained in this manual. Only figures with tolerances or limits can be considered as guaranteed data. Figures without tolerances are informative data, without guarantee.

## 2. CHARACTERISTICS

### 2.1. ELECTRICAL DATA

The values given in this section are valid within the rated range of operation (0°C to +40°C). On delivery, the supply is adjusted at an ambient temperature of 25°C, with convection cooling.

#### 2.1.1. GENERAL

##### \* Safety

In accordance with IEC 348, safety class 1.

##### \* Dielectric strength test

For details, see Service Manual, Section 6.1.

##### \* Output terminals

Floating with respect to earth.

The voltage between any of the output terminals and earth may not exceed 250 V d.c. or a.c. (r.m.s.). The "+" or "-" (front or rear) may be earthed.

##### \* Interference level

Input: in accordance with VDE 0875 N-level for r.f.i. transferred to the mains.

### 2.1.2. INPUT

$U_m : 220 V \pm 10 \%$		$f_m : 50 - 60 \text{ Hz}$	
Type	Consumption	Inrush current max.	Efficiency (min.)
PE 1642/00	1.150 VA	40 A	62 %
PE 1644/00	950 VA	40 A	73 %
PE 1646/00	1.000 VA	40 A	79 %
PE 1648/00	975 VA	40 A	81 %

### 2.1.3. OUTPUT

TYPE PE /00	$U_o (1)$			$I_o (1)$		
	Coarse R1	Fine R2	Resolution	Coarse R3	Fine R4	Resolution
1642	0-20 V	0-0,2 V	0,5 mV	0-20 A	0 - 0,6A	10 mA
1644	0-40 V	0-0,4 V	1,0 mV	0-10 A	0 - 0,3A	5 mA
1646	0-75 V	0-0,75 V	2,0 mV	0-6 A	0 - 0,2A	3 mA
1648	0-150 V	0-1,5 V	4,0 mV	0-3 A	0 - 0,1A	1,5 mA

(1) Continuously adjustable

### 2.1.4. OUTPUT EFFECTS (IEC 478-2)

#### 2.1.4.1. AS VOLTAGE STABILIZER

Type PE /00	Source effect ( $U_m \pm 10 \% / -10 \%$ )	Settling effect *	Load effect 0-100 % 100-0 %	Settling effect
1642	0,01 % - 0,5 mV *	0,01 % - 0,5mV	+/-10 mV	+/-10 mV
1644	0,01 % - 0,5 mV *	0,01 % - 0,5mV	+/-10 mV	+/-10 mV
1646	0,003 % - 0,5 mV *	0,01 % - 1,5mV	+/-15 mV	+/-10 mV
1648	0,003 % - 0,5 mV *	0,005 % - 1,5mV	+/-15 mV	+/-10 mV

Type	Temperature coefficient (max.)	PARD (max.) mV p-p    mV r.m.s.	
PE 1642/00	0,01 %/°K - 0,2 mV/°K *	16	1
PE 1644/00	0,005 %/°K - 0,2 mV/°K *	12	1
PE 1646/00	0,005 %/°K - 0,5 mV/°K *	20	1
PE 1648/00	0,005 %/°K - 1,5 mV/°K *	25	1

\* Whichever is greater

Type	Transient recovery time $I_o : 50 \% - 100 \%$ $dI/dt = 1 \text{ A/us (max.)}$	Dynamic impedance (Ohm) (max.) (**) 1    10    100    250 kHz    kHz    kHz    kHz			
PE 1642/00	25 us	0,01	0,04	0,1	0,2
PE 1644/00	50 us	0,02	0,06	0,1	0,2
PE 1646/00	50 us	0,01	0,07	0,12	0,15
PE 1648/00	25 us	0,01	0,15	0,15	0,15

\*\* Sinusoidal variation ( $I_o : 80 \% - 100 \%$ )

## 2.1.4.2. AS CURRENT STABILIZER

Type PE /00	Source effect $U_m -10\%$ $+10\%$	Settling effect	Load effect Fig. 60	Settling effect	Temperature coefficient	Ripple current mA rms (max)
1642	$\pm 4$ mA	$\pm 2$ mA	$\pm 2$ mA	$\pm 3$ mA	2 mA/°K	10
1644	$\pm 2$ mA	$\pm 1$ mA	$\pm 2$ mA	$\pm 1$ mA	1 mA/°K	5
1646	$\pm 1,5$ mA	$\pm 1$ mA	$\pm 3$ mA	$\pm 1$ mA	0,5 mA/°K	4
1648	$\pm 0,5$ mA	$\pm 0,5$ mA	$\pm 2$ mA	$\pm 1$ mA	0,3 mA/°K	3

## 2.1.5. PROTECTION

### General

- Adjustable constant current stabiliser
- Sense protection
- Reverse voltage protection
- Mains fuses

Type	Overvoltage protection (R5)		Crowbar	Overcurrent protection
	$U_{min}$	$U_{max}$		
PE 1642/00	0,3 V	21,5 V	Option	X
PE 1644/00	0,5 V	42 V	Option	-
PE 1646/00	1,0 V	77 V	-	X
PE 1648/00	1,5 V	152 V	-	X

## 2.2. ENVIRONMENTAL DATA

Details of these procedures are supplied on request by the PHILIPS Organisation in your country, or by PHILIPS INDUSTRIAL & ELECTRO-ACOUSTIC SYSTEMS DIVISION, EINDHOVEN, THE NETHERLANDS.

### 2.2.1. ENVIRONMENTAL TESTS

#### Performance tests, operating

Description	IEC-68
Cold test	2-1 Ad 2 h. ( 0°C)
Dry heat	2-2 Bd 2 h. (+40°C)

#### Tests for storage and transport

Description	IEC-68
Cold test	2-1 Ab 72 h. (-40°C)
Dry heat	2-2 Bd 96 h. (+70°C)
Vibration test	2-6 Fc
Bump test	2-29 Eb
Cyclic damp heat test	2-30 Db 21 d. (+25°C to + 40°C)
	95 % RH

## 2.3. MECHANICAL DATA

Height : 132 mm	147 mm (B) (Table model)
Width : 444 mm	444 mm
Depth : 315 mm	360 mm (B) (Table model)
Mass : 21 kg	27 kg (with packaging)

### 2.3.1. MOUNTING

Table model (B)  
Rackmounted

## 2.4. ACCESSORIES

### OPERATING MANUAL

2 feet, 2 self-tapping screws for fixing Mains cable

### OPTIONAL

PE 1373/02 Rack adaptor for 2 fans  
PE 1374/02 Fan (110 V a.c.)  
Thyristor BTW 40 - 400 R (5322 130 24067)  
PE 1367/00 Programmer, see 5.5.4.1.

## DIRECTIONS FOR USE

## 3. INSTALLATION

This section deals with the preparation of the power supply for use. For mounting details concerning ventilation and ambient temperature conditions, refer to Section 2.2. "Environmental data" and Section 2.4. "Accessories". The power supplies are intended for 19-inch rack-mounting and are provided with two brackets on the front plate.

**WARNING :** Before connecting the power supply to the mains, the safety measures must be thoroughly understood and observed.

Bear in mind that all adjustments, replacements, repairs, etc. shall be carried out by a skilled person, who is aware of the hazards involved.

### 3.1. INITIAL INSPECTION

#### NOTE

THIS apparatus has been designed according to IEC publication 348, Class I and has been supplied in a safe condition. The present operating manual contains information and warnings which shall be followed by the purchaser to ensure safe operation and to retain the power supply in safe condition.

On delivery, the supply is connected for  $U_m = 220$  V and for local sensing ; for the connections on X 4, see Fig. 224.

### 3.2. MOUNTING INSTRUCTIONS

#### 3.2.1. RACK-MOUNTING

- It is recommended that a distance of 1 E (44 mm) is left between the instrument and adjacent instruments above or below it (the ambient temperature is defined as that measured 20 mm below the unit).
- For rack-mounting, the holes of the top and bottom plates will remain free to ensure adequate cooling of the instrument.
- The supply is fixed to the 19-inch frame by means of four M5 screws through the holes in the brackets (see Fig. 100).
- To maintain the ambient temperature of the instrument in the rack below 40°C, Philips fan unit is recommended (mounting, height : 1 E, width : 19 inch) PE 1373/02 and one or two fans (PE 1374/02) : one or two fans for a 110 V a.c. mains and two series-connected fans for a 220 V a.c. mains.

### 3.2.2. TABLE-MOUNTING

For installation as a free-standing version, proceed as follows :

- slide the two feet delivered into the slots B (see Fig. 110) and then retain the feet using the two self-tapping screws.
- remove the brackets for 19-inch mounting : unscrew the four M4 x 20 screws (two per hand-grip), accessible via slots in the side panels.

### 3.3. DISMANTLING

The instrument shall be disconnected from all voltage sources before any adjustment, replacement or maintenance and repair. Bear in mind that capacitors inside the instrument may still be charged, even if the instrument has been disconnected from all voltage sources. Subsequently, if any adjustment, maintenance or repair of the opened instrument under voltage conditions is inevitable, it shall be carried out only by a skilled person who is aware of the danger involved.

- The top and bottom cover-plate can be slid out after first removing five screws M2,5 x 4.
- The rear cover plate (see Fig. 110) can be removed after withdrawing the two screws M3 x 6.

### 4. CONNECTIONS

#### NOTE

During operation, the connections on the terminal block X 4 must not be interrupted, otherwise the power supply could be damaged.

#### 4.1. MAINS

See Fig. 110

The power supply must be connected to the mains voltage (a.c.) through the terminal block X 5 :

X 5 (2) and X 5 (3).

The cross-section of the input wires must be of adequate current-carrying capacity (also dependent on the distance between the source and the supply). Bear in mind that the cross-section of the earth conductor must be at least equal to the cross-section of the mains conductors and in accordance with the local safety regulations (e.g. colour, section etc ...).

#### 4.2. EARTHING


See Fig. 110

**WARNING** : Before any connection is made to a voltage source, the protective earth terminal shall be connected to a protective conductor.

\* If a three-core mains cable with mains plug is used, the mains plug shall be inserted into a socket outlet provided with a protective earth contact. The protective action shall not be negated by the use of an extension lead without a protective conductor (see also Section 7).

**WARNING** : When a power supply is brought from a cold to a warm environment, condensation may cause a hazardous condition ; ensure therefore that the earthing requirements are strictly adhered to.

To this end, the power supply must be connected to a protective earth in the following way :

- with the earthing screw X6  (M4) adjacent to X5.

#### 4.3. OUTPUT

The load may be connected either on the front panel or at the rear of the supply (see Fig. 100 and 110).

	-	+	⊥
Front	X1	X2	X3
Rear	X4 (3)	X4 (5)	X4 (4)

The load can be earthed via X3 or X4 (4).

**NOTE** : The output effects given in Section 2.1.4. are valid only if the load is connected either to the front or to the rear terminals ; the output voltage is measured on the sense terminals X4 (9) "-" and X4 (10) "+".

### 5. OPERATING INSTRUCTIONS

**NOTE** : During operation, the connection on the terminal block X4 (and between the terminals block X4 of the master and slave instruments) must not be interrupted, otherwise the power supply could be damaged.

#### 5.1. CONTROLS, INDICATORS, TERMINALS

See Fig. 100 and 110

Front	Item	Marking	Description
	R1	COARSE	Coarse adjustment of $U_0$
	R2	FINE	Fine adjustment of $U_0$
	R3	COARSE	Coarse adjustment of $I_0$
	R4	FINE	Fine adjustment of $I_0$
	R5	ADJUST	Adjustment of OVP trip-voltage
	V1, V2		Led (green) : constant voltage-constant current
	V3	FAILURE	Led (red) : OVP is operating
	P1, P2	V A	Voltmeter ( $U_0$ ) Ammeter ( $I_0$ )
	X1	-	Negative output terminal
	X2	+	Positive output terminal
	X3		Terminal for earthing the output
	S1	POWER ON	Switching the supply ON-OFF
Rear	F1, F2	8A, 16A	Mains fuses (delayed)
	X4 (1 to 20)		20-pole terminal block, connection of the different facilities
	X5 (1 to 3)		3-pole terminal block : 1, 2 mains / 3 earthing
	X6		Protective earth screw M 4

#### 5.2. SENSING

##### 5.2.1. LOCAL SENSING

See Fig. 224

On delivery, the power supply is connected for local sensing, load connected to the front-panel terminals (X1, X2) ; links X4 (10-11) and X4 (12-13).

**NOTE** : Bear in mind that if these links on X4 are incorrectly connected or interrupted, THE POWER SUPPLY WILL NOT START.

##### 5.2.2. REMOTE SENSING

See Fig. 230

- When the load is at some distance from the power supply or if the output characteristics must be defined on the load, remote sensing can be usefully employed to compensate for losses in the load lines.
- Remove the links X4 (10-11) and X4 (12-13) as for local sensing.
- Connect the + sense wire X4 (10) to the "+" of the load and the - sense wire X4 (9) to the "-" of the load.
- The sense wires should be twisted and screened if possible. The screen should be earthed at one end only and should not be used as one of the sensing conductors.

The output voltage goes to zero (OVP operates) if

- the load lines are interrupted
- sense lines or loadlines are inverted
- the voltage loss in one of the load lines exceeds 0,5 V

The voltage on the load is equal to, or less than, the adjusted voltage when the sense lines are interrupted. For optimum ripple rejection and dynamic response, a capacitor can be connected across the load :

PE 1642/00 : 2200  $\mu$ F - 40 V  
 PE 1644/00 : 1000  $\mu$ F - 63 V  
 PE 1646/00 : 560  $\mu$ F - 100 V  
 PE 1648/00 : 270  $\mu$ F - 160 V

NOTE : The front-panel voltmeter P1 indicates the voltage on the output terminals, which is not always that across the load.

### 5.3. SERIES AND PARALLEL CONNECTIONS

#### 5.3.1. SERIES CONNECTIONS WITHOUT AND WITH «MASTER-SLAVE» SYSTEM

Instruments of the same type may be series connected until the maximum permissible voltage of 250 V d.c. between any output terminal and earth is reached.

**WARNING :** Only one of the "+" or "-" terminals may be connected to earth.

When one of the output terminals "+" or "-" is connected to earth  $\perp$ , X3 or X4 (4) the adjusted output voltage is present between the unearthed output terminal and instrument chassis.

Instruments may be connected in series in two ways ; without and with the Master-Slave system.

##### 5.3.1.1. WITHOUT «MASTER-SLAVE» SYSTEM

Connect the "+" output X2 or X4 (5) of the first instrument with the "-" output X1 or X4 (3) of the second instrument, and so on. The voltage on the load will then be the sum of the individually adjusted output voltages, the current through the load is determined by the supply with the lowest current limitation.

If the output voltage of any instrument exceeds its adjusted OVP trip voltage, that instrument contributes no power to the load, the total output voltage is reduced by an amount equal to that of the tripped supply while current is still flowing through the load.

##### 5.3.1.2. WITH «MASTER-SLAVE» SYSTEM

NOTE : Only for supplies of the same type.

Action : Top plate removed (3.3.)  
 Remove R202 (Fig. 310)  
 Fit : R202, new value, (MR25 1 %) (Fig. 310)

Description :

Type PE	Old value	New value	Code
1642/00	1,96 kOhm	3,92 kOhm	5322 116 54591
1644/00	953 Ohm	3,83 kOhm	5322 116 54589
1646/00	464 Ohm	3,48 kOhm	5322 116 54585
1648/00	249 Ohm	3,65 kOhm	5322 116 54587

Connect : R (MR25 : 1 %) (Fig. 241)

Type PE	Value	Code
1642/00	10,0 kOhm	5322 116 54619
1644/00	30,1 kOhm	5322 116 54655
1646/00	64,9 kOhm	5322 116 50514
1648/00	140 kOhm	5322 116 54259

Connect : X1, X2 (or X4) (Fig. 241)

Set : R3, R4 "Slave" : to maximum  
 : R3, R4 "Master" : adjustment of load current  
 : R1, R2 "Master" :  $U_0$  (summation voltage) (1)  
 : R1, R2 "Slave" inoperative  
 : R5 "Master and Slave" : OVP  
 OVP "Master" ON : total  $U_0 = 0$  V  
 OVP "Slave" ON  $U_0$  reduced  
 $I_0$  remains

Switch-on (with S1)  
 Always switch the "Slave" power supplies ON before the "Master".

(1): - every supply is adjusted to the same voltage

### 5.3.2. PARALLEL OPERATION, WITHOUT AND WITH «MASTER-SLAVE» SYSTEM

Parallel connections of instruments of the same type and without internal or external crowbar is unlimited and can be achieved in two ways : without and with Master-Slave system.

#### 5.3.2.1. WITHOUT «MASTER-SLAVE» SYSTEM

See Fig. 100

Connect : All "-" output terminals X1 or X4 (3)  
 All "+" output terminals X2 or X4 (5)

Set : R1, R2 (each supply to the same value)  
 $U_0$  (no load) = highest value  
 $U_0$  (full load) = lowest value  
 R3, R4 (of each supply)  
 $I_0$  = summation of all currents  
 R5 (of each supply)

If any OVP operates,  $U_0$  and  $I_0$  are determined by the remaining supplies.

#### 5.3.2.2. WITH «MASTER-SLAVE» SYSTEM

See Fig. 246

Connect : X1, X2 (or X4), and X4

Set (Fig. 100)  
 R1, R2 "Slave" =  $1,02 \times U_0$  (max.)  
 R1, R2 "Master" =  $U_0$   
 R3, R4 "Master"  
 $I_0$  of each supply is determined by R3, R4 of the "Master".  
 R3, R4 "Slave" inoperative  
 R5 of each supply  
 $I_0$  of each supply is determined by R3, R4 of the "MASTER"

If one OVP operates,  $U_0 = 0$  V

Switch-on (S1)  
 Always switch the "Slave" power supplies ON before the "Master".

### 5.4. EXTERNAL CONTROLS: REMOTE ON/OFF AND REMOTE OFF

\* REMOTE ON-OFF (Fig. 261)

Connect  
 Contact S2 between X4 (17) and X4 (20)  
 Requirements : contact S2 : current min. 1 mA  
 voltage min. 10 V

Action	Description
S2 open	$U_0$ (R1, R2)
S2 closed	$U_0 = 0$ V
S2 open	$U_0$ (R1, R2)

\* REMOTE OFF (Fig. 260)

Connect  
 External voltage source G1 (via a diode e.g. BAW 62)  
 Requirements : diode current min. 1 mA  
 reverse voltage min. 20 V  
 source (G1) current min. 1 mA  
 voltage max. 12 V

Action : G1 max. 1,0 V  
 $U_0$  (R1, R2)

Action : G1 min. 1,5 V / max. 12 V  
 $U_0 = 0$  V  
 $U_0$  remains 0 V (OVP operates)

Action : S1 OFF and G1 disconnected or max. 1 V

Action : S1 ON  
 $U_0$  (R1, R2)

## 5.5. ADJUSTMENTS

### 5.5.1. GENERAL

**WARNING** : When changing the mains voltage, the marking of the modified components and the type plate must be suitably adapted.

**NOTE** : Bear in mind that capacitors inside the instrument may still be charged, even if the instrument has been disconnected from all voltages sources.

### 5.5.2. MAINS

On delivery, the supply is set to 220 V mains.

**NOTE** : In order to meet the safety requirements, the wires must be fixed to the solder tags of the transformer T26, T27 in such a way that, when the solder melts, they do not become detached.

- For other mains voltages, see the table below (see also Fig. 140 and 560) : remove the top and bottom plates (see 3.3.).

Mains Voltage $U_m$	Input connections		Points to interconnect		Fuses delayed F1-F2
	T26	T27	T26	T27	
110 V	5 9	N 4	2-7-8-9, 3-4-5	1-3, 2-4-5	16 A
127 V	5 10	N 6	2-7-8-9, 3-4-5	1-3, 2-4-5	16 A
220 V	5 9	N 4	2-3, 4-5, 7-8-9	2-3, 4-5	8 A
240 V	5 10	N 6	2-3, 4-5, 7-8-9	2-3, 4-5	8 A

### 5.5.3. OUTPUT

#### 5.5.3.1. OUTPUT VOLTAGE $U_o$

See Fig. 100 & Sec. 2.1.3.

#### 5.5.3.2. OUTPUT CURRENT $I_o$

See Fig. 100 & Sec. 2.1.3.

The output current can be adjusted by short circuiting the output terminals. It is recommended to first set a low value of output voltage.

**NOTE** for PE 1648/00

If the instrument works as a constant current source the output voltage ( $U_o$ ) varies due to load variations.

At fast (higher than 500 V/s) drops of  $U_o$ , it is possible that the output current ( $I_o$ ) could be lower than the adjusted value during a short time.

When for example  $U_o = 150$  V and  $I_o = 3$  A there must be a drop higher than 50 V (see Fig. 62) with a rate higher than 500 V/s for the  $I_o$  to be lower than the adjusted  $I_o$  during 0,5 s (see Fig. 64) at maximum.

At  $U_o = 150$  V and  $I_o = 2$  A, the drop must be higher than 90 V and at  $U_o = 150$  V and  $I_o = 1$  A, higher than 130 V. Figure 63 shows the voltage drop that must occur at a  $U_o$  of 75 V in the constant range for the  $I_o$  (see Fig. 65) to be lower than the adjusted  $I_o$ .

If the above-mentioned phenomenon occurs, V2 (current-source indication) extinguishes and V3 "FAILURE" (indication O.V.P.) lights up.

#### 5.5.3.3. O.V.P.

See Fig. 100 and Section 2.1.5.

Adjustable with R5 (screwdriver adjustment).

V3 : ON when O.V.P. is operating.

To set O.V.P. turn R5 completely clockwise. Switch on and turn voltage control to indicate O.V.P. level required.

Turn R5 anti-clockwise until "FAILURE" is lit (i.e. O.V.P. operates).

When the O.V.P. operates (indicated by V3) then the output voltage drops to 0 V. Switch OFF the instrument, turn R1 to the left, switch ON and adjust the required output voltage with R1 and R2.

### 5.5.4. PROGRAMMING (output voltage and current)

The output voltage and current can be controlled externally, either by means of a resistor or by a voltage source. When external programming is used, the following provisions apply : the output stability is dependent upon the stability of the external control elements and the overvoltage protection must be adjusted according to the maximum output voltage.

To prevent additional ripple, the wires to the programming device should be twisted and screened.

Type PE /00	$U_o$ programming	
	with resistor $R_p$ max. 10 kOhm 0,1W (1) Fig. 274	with voltage $U_p$ max. 10 V 1 mA (2) Fig. 279
1642	2 V per 1 kOhm	2 V per 1 V
1644	4 V per 1 kOhm	4 V per 1 V
1646	7,5 V per 1 kOhm	7,5 V per 1 V
1648	15 V per 1 kOhm	15 V per 1 V

Type PE /00	$I_o$ programming (3) (4)	
	with resistor $R_p$ max. 1 kOhm 0,1W Fig. 284	with voltage $U_p$ max. 0,5 V 0,5 mA Fig. 289
1642	2 A per 100 Ohm	1 A per 25 mV
1644	1 A per 100 Ohm	1 A per 50 mV
1646	1 A per 167 Ohm	1 A per 83 mV
1648	1 A per 333 Ohm	1 A per 166 mV

- (1) - the values are only valid when R1 and R2 are set to give the nominal output voltage before programming (R1 and R2 remain operative).  
- programming is also possible between 0 V and the output voltage adjusted by R1 and R2 without programming, programming is linear for  $R_p$  between 0 and 10 kOhm.
- (2) R1 and R2 inoperative ;  
 $U_p$  : internal resistance max. 100 Ohm.
- (3) R3 and R4 inoperative
- (4) - for PE 1642-44-46 : if the connection to the external programming device is inadvertently disconnected, the current limiting will be inoperative.  
- for PE 1648 : the instrument overcurrent protection facility operates for inadvertent disconnection of the external programming device

#### 5.5.4.1. PROGRAMMING WITH PE 1367/00

See Fig. 800, 801, 802

SPECIFICATIONS PE 1367/00

INPUT : 220 Va.c. (110 V - 120 V - 240 V)

OUTPUT :

Output voltage

- high range unipolar mode : 0 V ... 10 V ;  
bipolar mode :- 10 V ... + 10 V ;  
- low range unipolar mode : 0 V ... 1 V ;  
bipolar mode :- 1 V ... + 1 V

Resolution : unipolar mode bipolar mode  
high range 10 mV 20 mV  
low range 1 mV 2 mV

Output current : unipolar and bipolar : 10 mA

Output impedance (d.c.) : max 0,1 Ohm

Linearity error :  $\pm 1/2$  LSB (least significant bit)

Zero adjust : Plus or minus 500 mV

Full scale adjust : Plus or minus 5 %

Programming speed : Typ. 1  $\mu$ sec/volt (typical)

Number of channels : 2  
 Galvanic isolation : 1.000 V d.c.  
 Interface functions : AH1, L1, SH1, DC1, SR1  
 Programming modes : 2 (% , AUTO)  
 Calibration : "Off line" possible  
 Current sink : for channel 1  
 Temperature coefficient : 150 ppm/°K max.

ACCESSORIES : Adapter IEC-IEEE Bus : PM 9483  
 Cable IEC 1 m : PM 9480  
 Cable IEC 1 m : PM 9481

## 5.6. OPTIONS: INTERNAL OR EXTERNAL CROWBAR (ONLY FOR PE 1642/00 AND PE 1644/00)

When the output voltage reaches the adjusted trip voltage, the thyristor pre-regulation is blocked. The power that is at this instant stored in the output capacitor is discharged into the load. To prevent the instantaneous power being dissipated in the load, the output can be short-circuited by a thyristor (crowbar action).

After operation of the O.V.P., the output voltage is only obtainable after switching the instrument OFF and then ON again.

### Requirements :

- minimum OVP trip voltage : 4 V
- maximum delivered control current : 120 mA
- thyristor BTW 40-400 R code : 5322 130 24067

NOTE : When a thyristor BTW 40-400 R is used, the operating time, i.e. the interval during which the output voltage rises above and returns to the trip voltage, is typically 1,2 msec, with an overshoot lower than 130 mV.

OPTION : INTERNAL / Section 3.3.		PE 1642 Fig.330	PE 1644 Fig.331
Sequence	Comment		
Remove Unsolder	Top and bottom plate R50 from V50 (C) to C27 (+) V50 (B)	X X X	X X X
		V50 (E) V67 (A)	V50 (E) V64 (A)
Remove Mount	V50 (with its insulation) Crowbar thyristor, (insulated from cooling unit) See NOTE 1	X X	X X
Solder	From thyristor to G wire for V50(B) 2 A V67(K)(min.0,75mm <sup>2</sup> ) K (min.0,75mm)	X X X	X X X
		V67 (A)	V64 (A)
Replace	Top and bottom plate	X	X
OPTION : EXTERNAL (2) / Section 3.3.			
Remove		Top plate	Bottom plate
Unsolder	V50 (B)	X	X
Insulate Replace	end of wire to V50 (B)	X Top plate	X Bottom plate
Connect (min. 2 0,75mm)	From thyristor to G X4 (7) A X4 (5) K X4 (3)		

NOTE (1) : Insulation for BTW40-400R : 5322 255 40101  
 (2) : Insulate the thyristor from its mounting or insulate the mounting unit if the thyristor is mounted directly on it.

### 5.6.1. COMBINED FACILITIES

The external connections (see Fig. 294) are given for combining : series connection in accordance with the master-slave system, remote voltage adjusting and remote ON/OFF.

In Fig. 295, the external connections are given for combining : parallel connection in accordance with the master-slave system, with crowbar protection, remote sensing, remote ON/OFF and remote voltage- and current control.

## 6. SERVICING

See WARNING B : Servicing by qualified person only !

For servicing, or if other technical information is required, please contact :  
 your local Sale and Service address (back-side of the Operating Manual)  
 OR  
 the "Supply Centre".

PHILIPS INDUSTRIE s.a.  
 Service Power Supplies Department  
 Boulevard de l'Europe, 131  
 B-1301 WAVRE  
 BELGIUM  
 Telex : 59058 philwa b  
 Tel : 10/41.65.11

Safety measures require that the instrument should first be put into its original state and that the spare parts are identical to the original components.

The instrument shall be disconnected from all voltage sources before any adjustment, replacement or maintenance and repair. Bear in mind that capacitors inside the instrument may still be charged, even if the instrument has been disconnected from all voltage sources. Consequently, if any adjustment, maintenance or repair of the opened instrument under voltage conditions is inevitable, it shall be carried out only by a skilled person who is aware of the danger involved.

The use of a mains-isolating transformer during service is necessary.

### 6.1. FUSE REPLACEMENT

This power supply is protected by the delayed-action fuses FI-F2 (8 A or 16 A, 250 V). For continued protection against fire and shock hazard, only fuses with the required rated current and of the specified type shall be used for replacement. The use of repaired fuses and short-circuiting of fuseholders shall be avoided. The instrument shall be disconnected from all voltage sources when a fuse is to be replaced. As the power supply is electronically protected against most faults, a blown fuse indicates a major defect. Before replacing the fuse, always check the electronic circuits. Code numbers of fuses :

FI-F2 110 V 8 A delayed 250 V 5322 253 50036  
 16 A delayed 250 V 5322 253 54042

## 7. WARNING SYMBOLS



Protective earth terminal

Any interruption of the protective conductor inside or outside the apparatus or disconnection of the protective earth terminal is likely to make the apparatus dangerous ; intentional interruption is prohibited.



For servicing or for other reasons, it is essential for the user to refer to the Operating Manual (Sections 3 and 6) and the Service Manual (Sections 4 and 6) in order to safeguard against damage to the instrument.

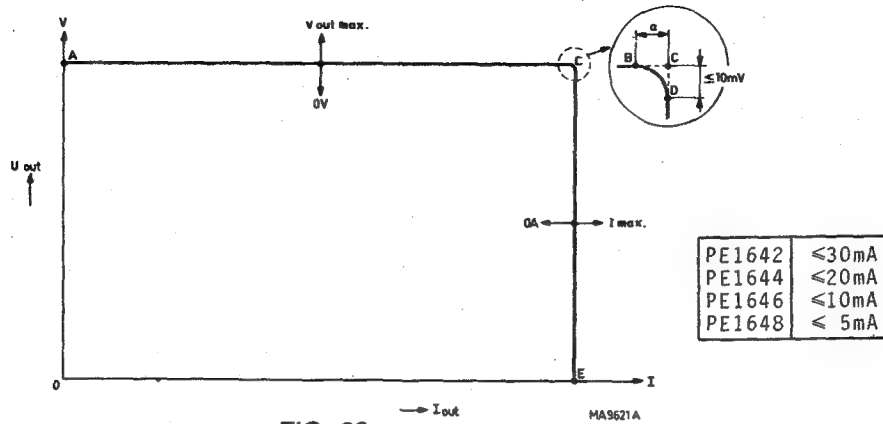
PE 1642-44-46-48/00: OUTPUT CHARACTERISTIC  $I_o/U_o$ 

FIG. 60

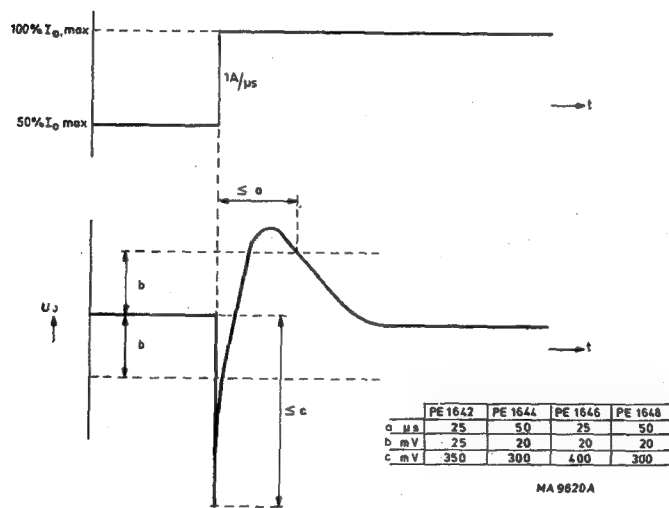
PE 1642-44-46-48/00: OUTPUT CHARACTERISTICS  $U_o/t$ 

FIG. 61

## PE 1648/00: OUTPUT CHARACTERISTICS

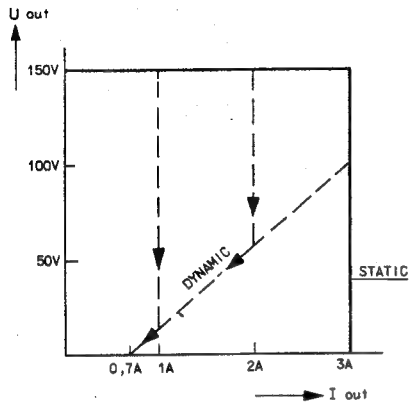
 $I_o / U_o = 150 \text{ V}$ 

FIG. 62

WV598

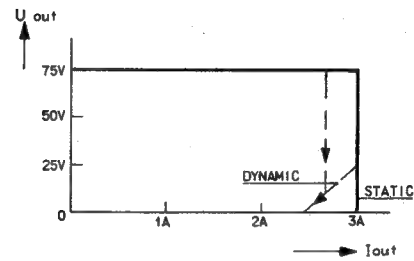
 $I_o / U_o = 75 \text{ V}$ 

FIG. 63

WV599

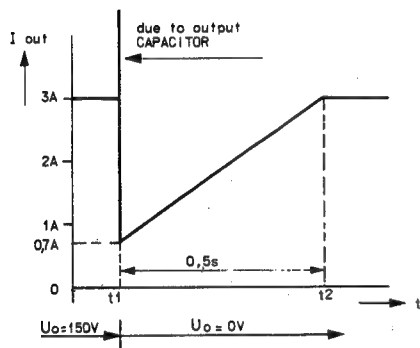
RECOVERY TIME  
 $U_o = 150 \text{ V}$ 

FIG. 64

WV600

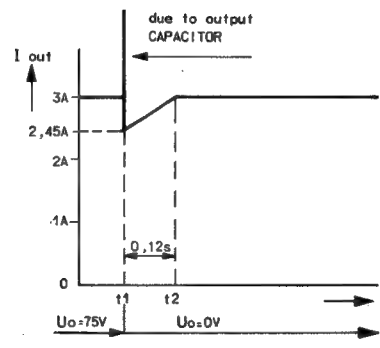
RECOVERY TIME  
 $U_o = 75 \text{ V}$ 

FIG. 65

WV601

PE 1642-44-46-48/00: FRONT VIEW

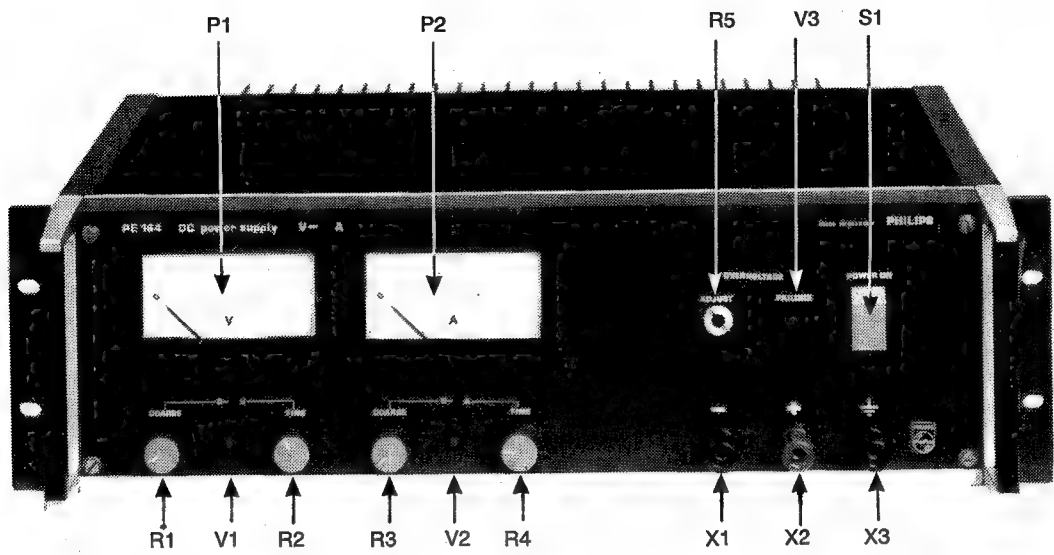


FIG. 100

PE 1642-44-46-48/00: REAR VIEW

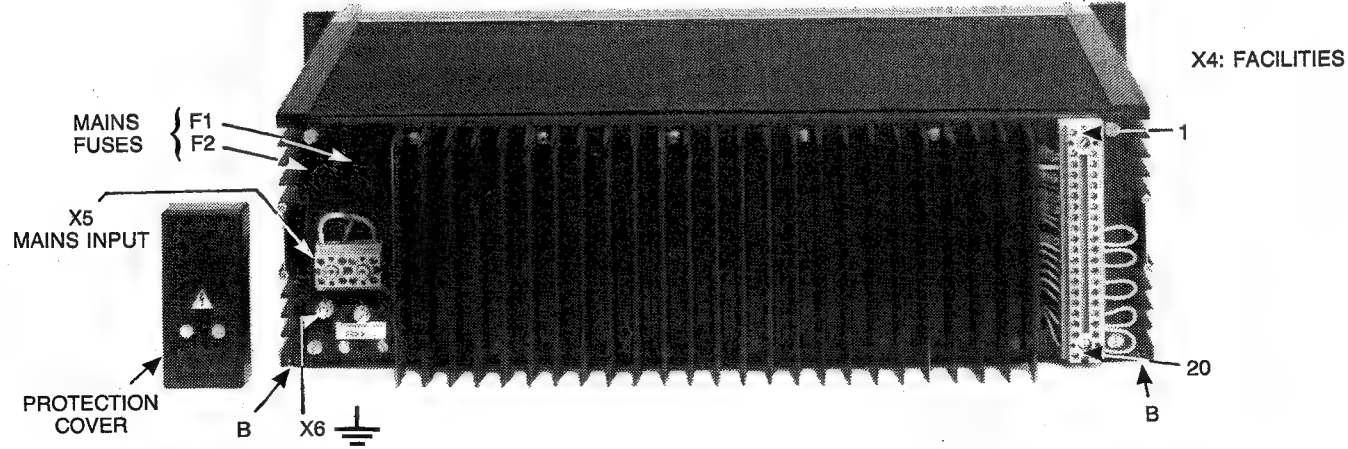


FIG. 110

## PE 1642, 1644/00: TOP VIEW

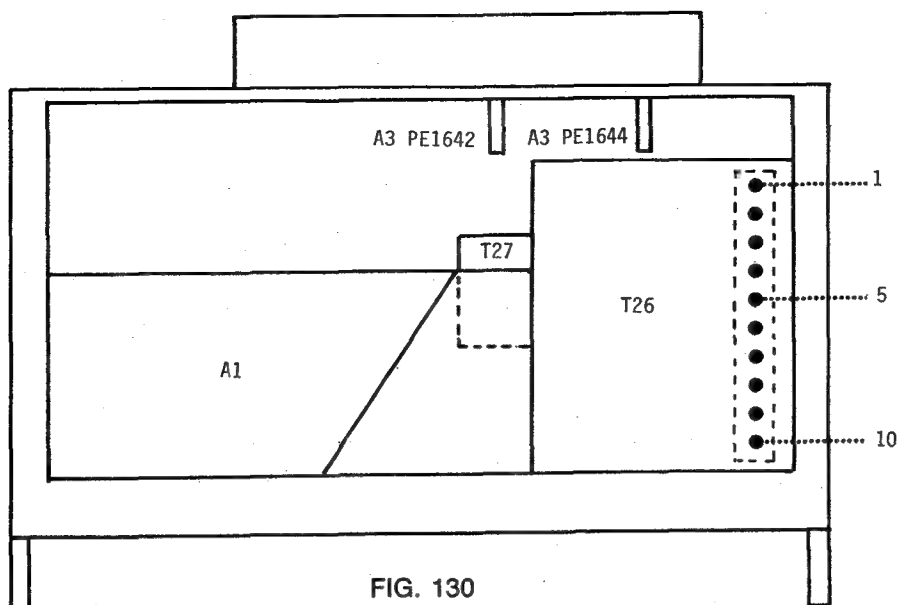
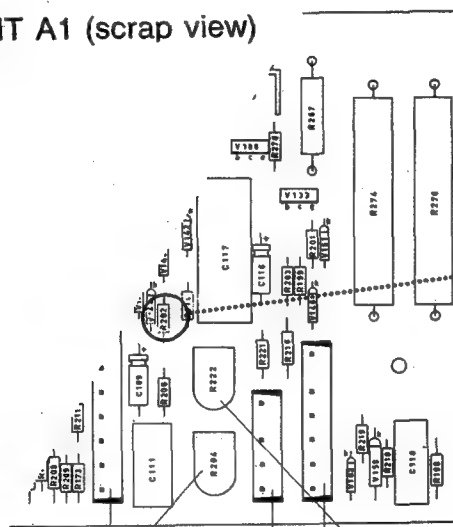


FIG. 130

## PRINT UNIT A1 (scrap view)



Note : the location of R202

is identical for PE1642-44-46-48

FIG. 310

## PE 1642 UNIT A3 (scrap view)

## T27 AUXILIARY TRANSFORMER

PE1642 UNIT A3 (scrap view)

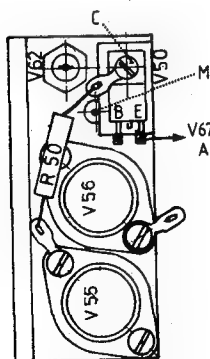
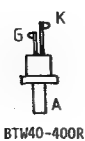


FIG. 330

M hole for BTW40-400R  
(insulated)

BTW40-400R

## PE 1644 UNIT A3 (scrap view)

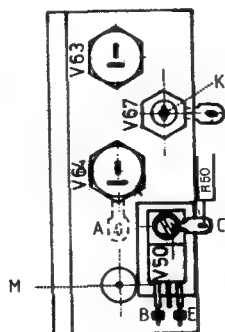


FIG. 331

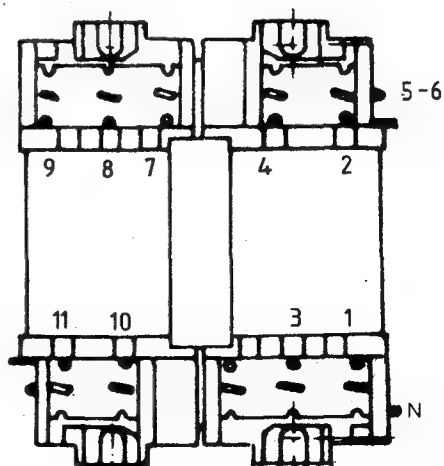


FIG. 560

# PE 1642-44-46-48/00: EXTERNAL CONNECTIONS

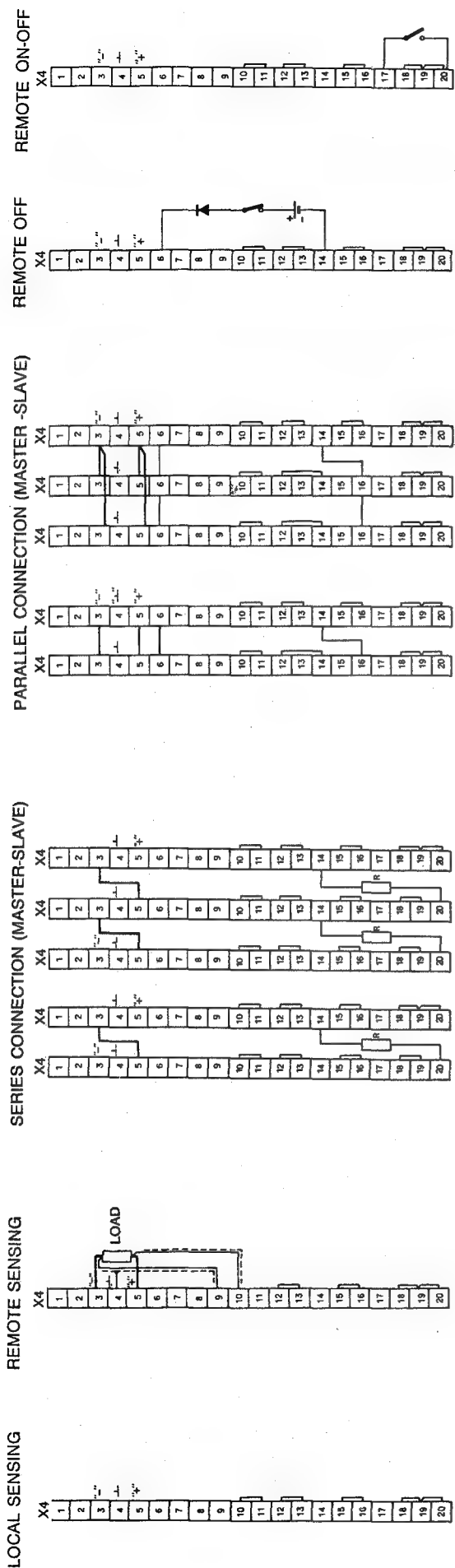


FIG. 224 W606

FIG. 230 W607

FIG. 241 W609

FIG. 246 W608

FIG. 260 W610

FIG. 261 W611

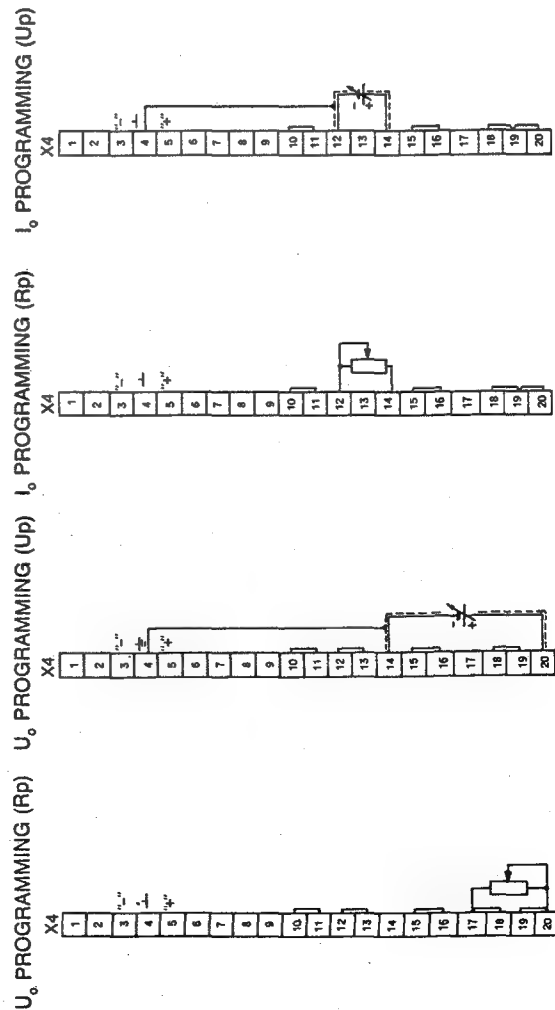


FIG. 274 W612

FIG. 279 W613

FIG. 284 W614

FIG. 289 W615

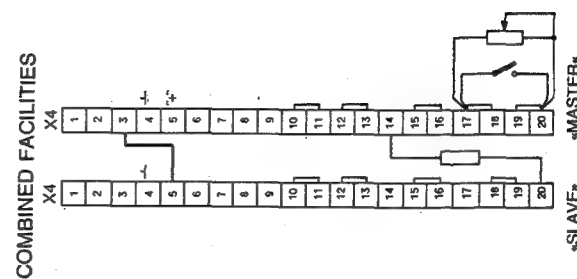


FIG. 294 W616

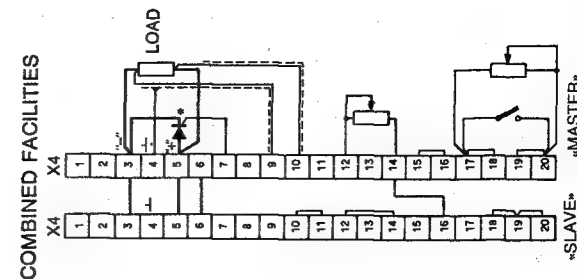


FIG. 295 W617

Connection for combination of facilities  
 • crowbar protection only for PE 1642 — PE 1644

## PE 1367/00 BLOCK DIAGRAM

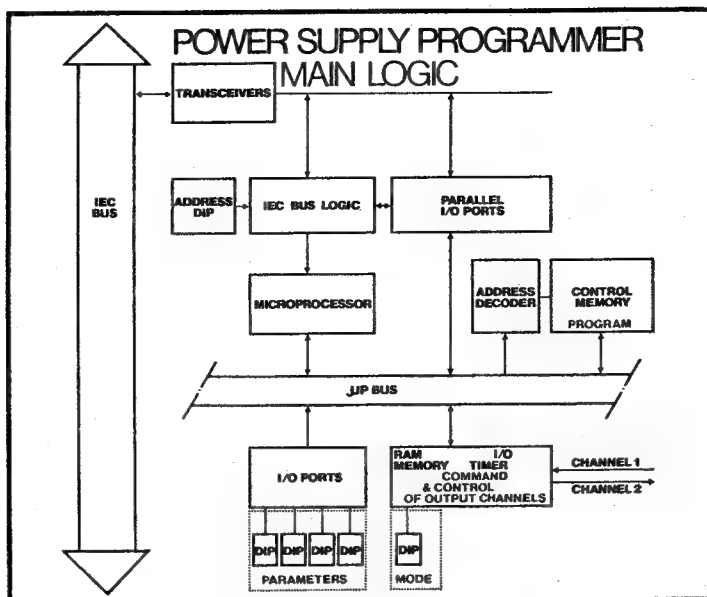


FIG. 800

## PE 1367/00 BLOCK DIAGRAM: CHANNEL 1

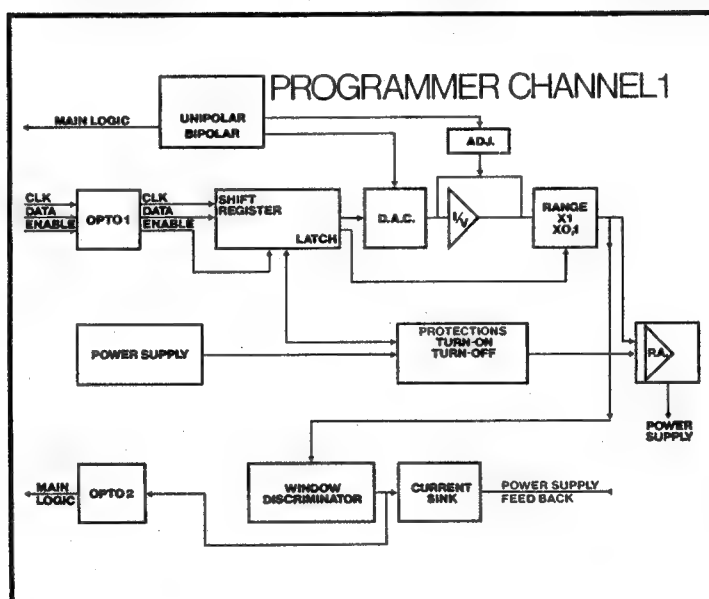


FIG. 801

## CONNECTIONS

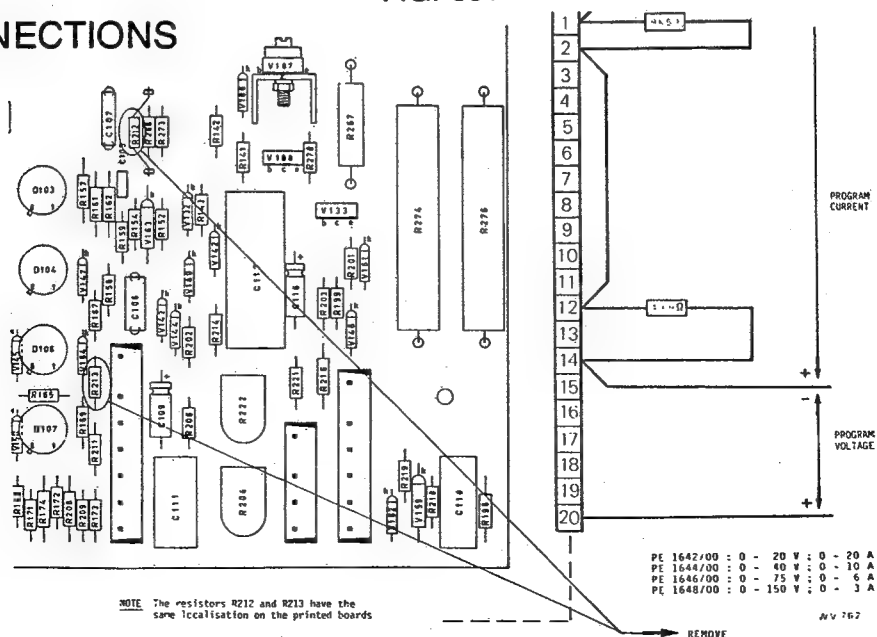
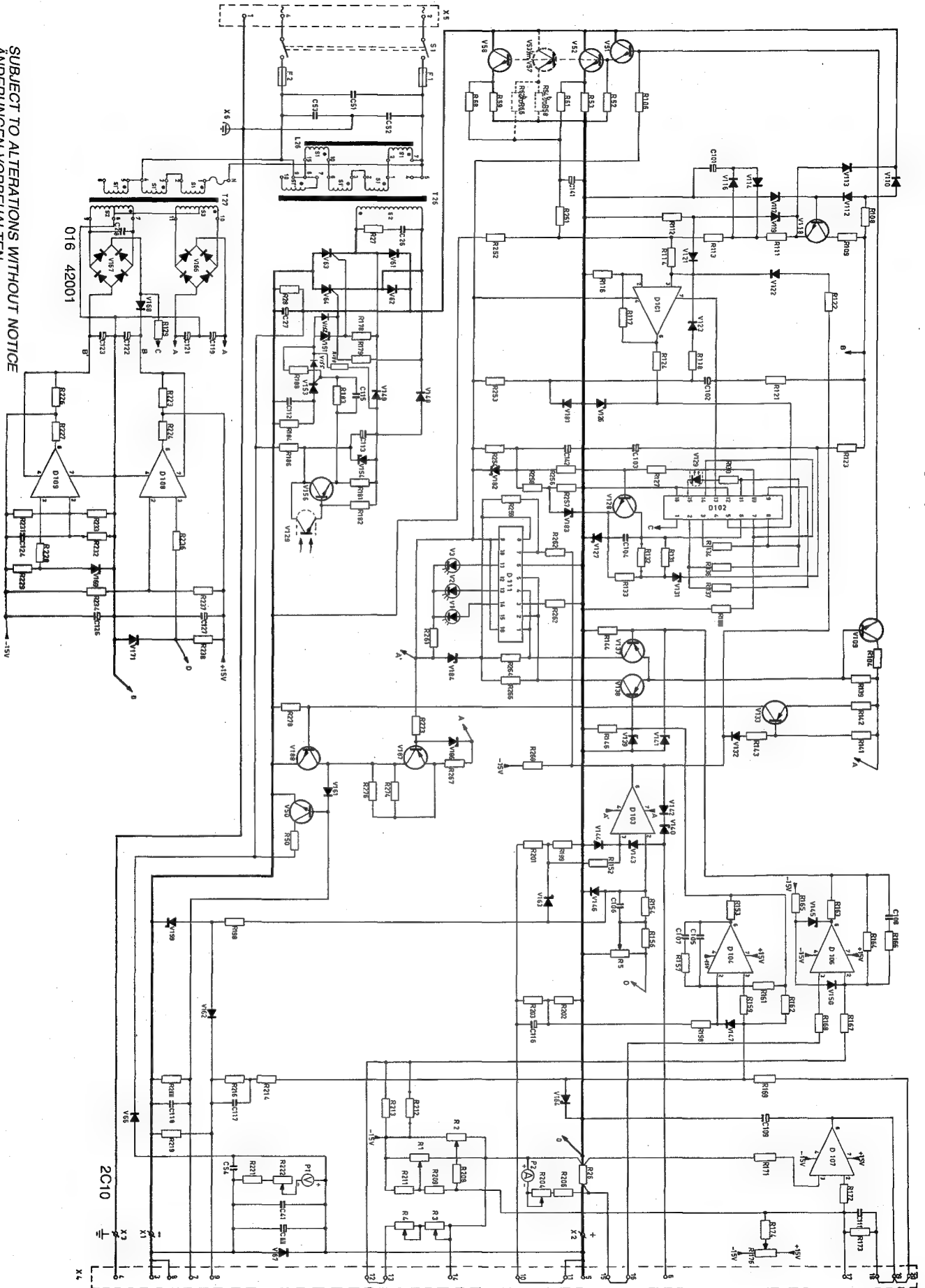


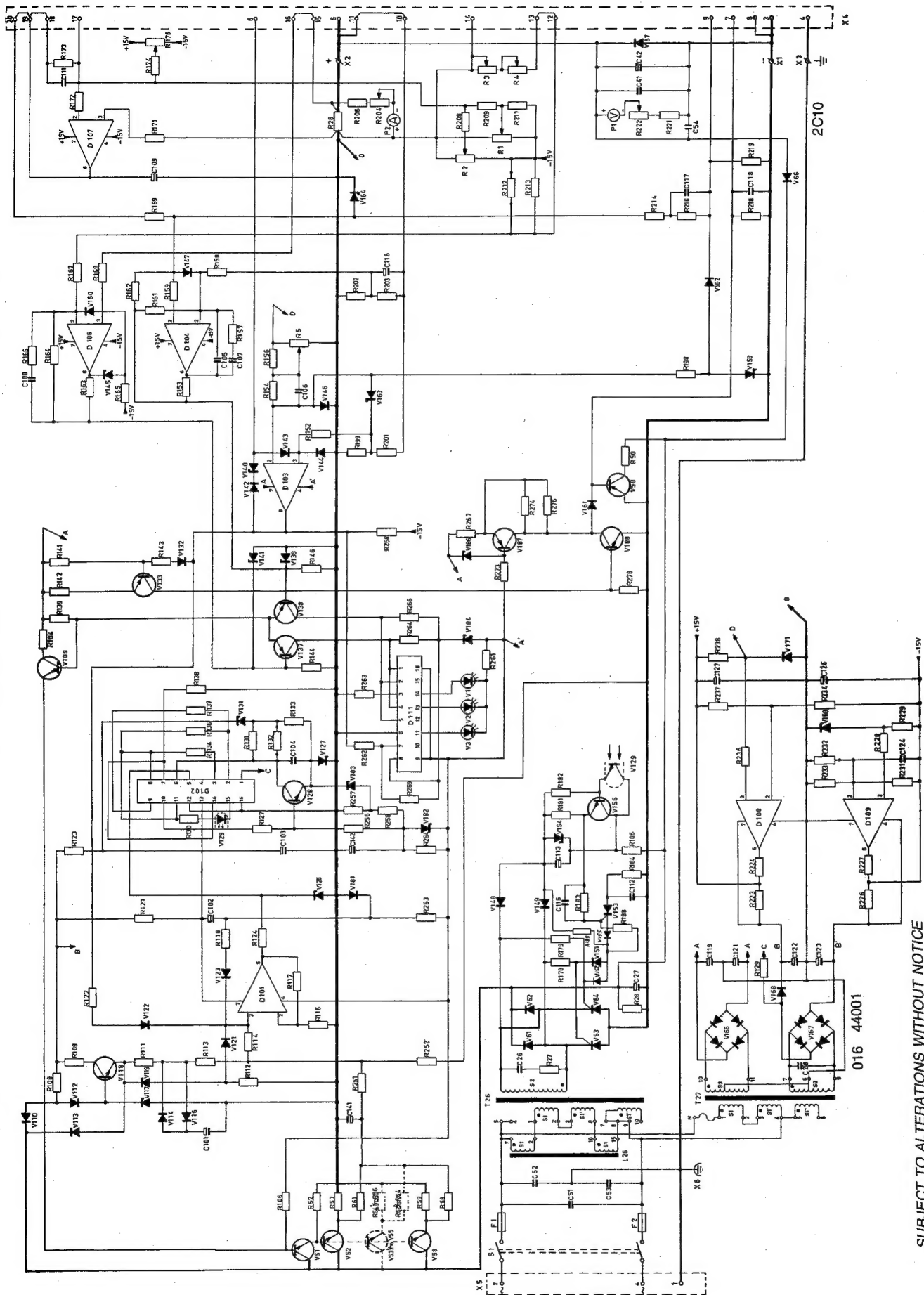
FIG. 802

## PE 1642/00 : CIRCUIT DIAGRAM



SUBJECT TO ALTERATIONS WITHOUT NOTICE  
 ÄNDERUNGEN VORBEHALTEN  
 NOUS NOUS RESERVONS LE DROIT DE MODIFIER SANS PREAVIS

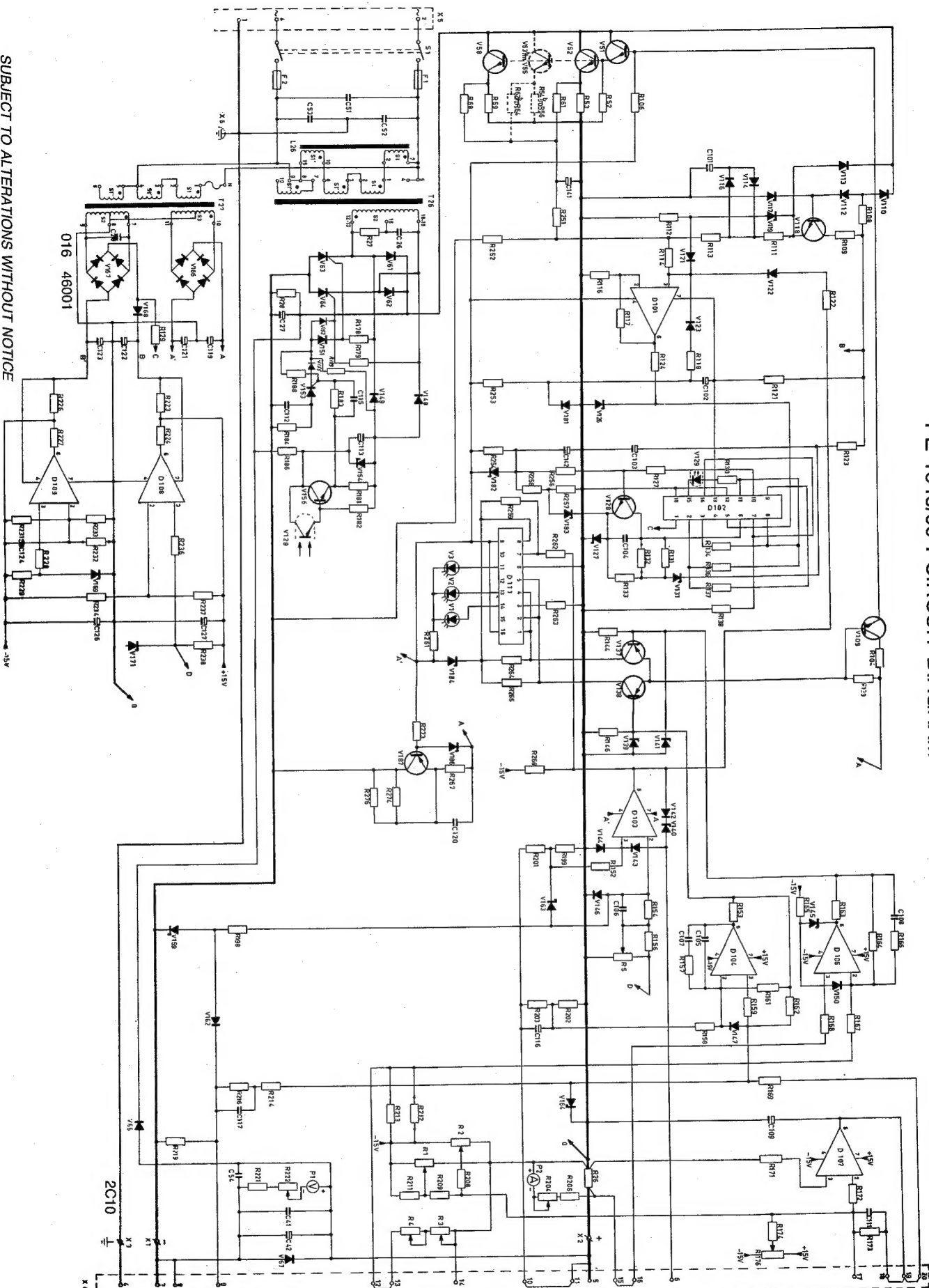
FIG. 1000

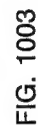


SUBJECT TO ALTERATIONS WITHOUT NOTICE  
 ÄNDERUNGEN VORBEHALTEN  
 NOUS NOUS RESERVONS LE DROIT DE MODIFIER SANS PREAVIS

FIG. 1001

## WV 6313





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tel. 212-302992/303446/304764

**Nederland:** Philips Nederland,  
Hoofdgroep PPS, Boschdijk 525, Gebouw VB,  
5600 PD Eindhoven, tel. 31-40-793333

**Ned. Antillen:** Philips Antillana N.V.,  
Schottegatweg Oost 146,  
Postbus 3523, Willemstad, Curacao,  
tel. 599-9-615277/612799

**New Zealand:** Philips New Zealand Ltd.,  
Scientific and Industrial Equipment Division,  
68-86 Jervois Quay, G.P.O. Box 2097,  
Wellington; tel. 64-4-735735

**Nigeria:** Associated Electronic Products (Nigeria) Ltd.,  
KM16, Ikorodu Road, Ojota, P.O. B. 1921, Lagos,  
tel. 234-1-900160/69

**Nippon:** NF Trading Co. Ltd.,  
Kimimoto Bldg. 11 2,  
Tsunashima Higashi 1-Chome, Kohoku ku,  
Yokohama

**Norge:** Norsk A.S. Philips,  
Dept. Industry and Telecommunication, Sandstuveien 70,  
Postboks 1, Manglerud, N 0680 Oslo 6, tel. 47-2-680200

**Oesterreich:** Österreichische Philips Industrie GmbH,  
Abteilung Industrie Elektronik,  
Triesterstrasse 84,  
Postfach 217, A-1100 Wien;  
tel. 43-222-645521/629141

**Pakistan:** Philips Electrical Co. of Pakistan Ltd.,  
P.O. B. 7101,  
Karachi 3; tel. 92-21-725772

**Paraguay:** Philips del Paraguay S.A.,  
Av. Artigas 1519,  
Casilla de Correo 605, Asunción;  
tel. 595-21-291924/291934

**Perú:** Philips Peruana S.A.,  
Av. Alfonso Ugarte 1268, Lima 5,  
Apartado Aéreo 1841, Lima 100, tel. 51-14-326070

**Philippines:** Philips Industrial Development Inc.,  
2246 Pasong Tamo,  
Makati, Metro Manila, tel. 63-2-868951/868959

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1009 Lisboa Codex, Av. Eng. Duarte Pacheco 6, 1000 Lisboa;  
tel. 351-1-683121/9  
Service Centre:  
Serviços Técnicos Profissionais, Outurela/Carnaxide, P.O. Box 55  
2795 Linda-a-Velha; tel. 351-1-2180071

**Saudi Arabia:** Delegate Office of Philips Industries,  
Sabreen Bldg., Airport Road, P.O. Box 9844,  
Riyadh; tel. 966-1-4777808/4778463/4778216/4778335

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Allmendstrasse 140, Postfach 670, CH-8027 Zurich;  
tel. 41-1-4882211

**Singapore:** Philips Project Development(S) Pte. Ltd.,  
Lorong 1, Tao Payoh, 1st floor,  
P.O. Box 340, Tao Payoh Central Post Office,  
Singapore 9131, tel. 65-2538811

**South Africa:** South African Philips (Pty) Ltd.,  
2 Herb Street, New Doornfontein, P.O. B. 7703,  
Johannesburg 2000; tel. 27-11-6179111

**South Korea:** Philips Electronics (Korea) Ltd.,  
260-199, Itaewon-dong, Yongsanku,  
C.P.O. Box 3680, Seoul; tel. 794 5011/5

**Suomi:** Oy Philips AB.,  
Kaivokatu 8,  
P.O. Box 255,  
SF-00101 Helsinki 10; tel. 358-0-17271  
Service Centre:  
Sinikalliontie 1-3,  
P.O. Box 11, SF-02630 Espoo;  
tel. 358-0-523122

**Sverige:** Philips Försäljning AB,  
Div. Industri Elektronik, Tegelvägen 1,  
Fack, S-11584 Stockholm; tel. 46-8-7821000

**Syria:** Philips Moyen Orient S.A.R.L., Rue Fardoss 79,  
B.P. 2442, Damas;  
tel. 221650/218605/228003/221025

**Taiwan:** Philips Taiwan Ltd.,  
150, Tun Hya North Road,  
P.O. Box 22978, Taipei;  
tel. 886-2-712 0500

**Tanzania:** Philips (Tanzania) Ltd.,  
T.D.F.L. Building (1<sup>st</sup> floor), Ohio/Upanga Road  
P.O. Box. 20104, Dar es Salaam; tel. 29571/4

**Thailand:** Philips Electrical Co. of Thailand Ltd.,  
283 Silom Road, P.O. Box 961, Bangkok 10500;  
tel. 66-2-2336330/9/2355665.8

**Tunisia:** S.T.I.E.T., 32 bis, Rue Ben Ghedhahem,  
Tunis; tel. 216-1-348666

**Türkiye:** Türk Philips Ticaret A.S.,  
İnönü Caddesi 78/80  
Posta Kutusu 504, Beyoğlu,  
İstanbul, tel. 90-1-1435910

**United Arab Emirates:** Philips Middle East B.V.,  
Dubai International Trade Centre, Level 11,  
P.O. Box 9269, Dubai; tel. 971-4-37700

**United Kingdom:** Pye Unicam Ltd., York Street,  
Cambridge CB1 2PX; tel. 44-223-358866  
Service Centre:  
Pye Unicam Ltd.,  
Service Division,  
Beddington Lane,  
Croydon CR9 4EN;  
Tel.: 44-1-6843670

**Uruguay:** Industrias Philips del Uruguay S.A.,  
Avda. Uruguay 1287, Casilla de Correo 294,  
Montevideo, tel. 915641/2/3/4-919009  
Service 387777-387878-388484

**U.S.A.:**  
Philips Test and Measurement Department Inc.,  
California, Garden Grove 92645  
12882 Valley View Street, Suite 9,  
tel. (213) 594-8741/(714) 898-5000  
California, Milpitas 95035  
477 Valley Way;  
tel. (408) 946-6722  
Florida, Winter Park 32789  
1850 Lee Road, Suite 229,  
tel. (305) 628 1717  
Illinois, Itasca 60143  
500 Park Blvd., Suite 1170,  
tel. (312) 773-0616  
Massachusetts, Woburn 01801  
21 Olympia Avenue;  
tel. (617) 935-3972  
Minnesota, Minneapolis 55420  
7851 Metro Parkway, Suite 302,  
tel. (612) 854-2426  
New Jersey, Mahwah 07430  
85 McKee Drive;  
tel. 1-201-5293800, Toll-free 800-6317172

**Venezuela:** Industrias Venezolanas Philips S.A.,  
Av. Diego Cisneros, Edificio Centro Colgate,  
Apartado Aéreo 1167, Caracas 1010-A;  
tel. 58-2-2393811/2392222/2393933

**Zaire:** S.A.M.E./s.a.r.l., 137, Boulevard du 30 juin,  
B.P. 16636, Kinshasa;  
tel. 31887-31888-31921

**Zambia:** Philips Electrical Zambia Ltd.,  
Mweneshi Road, P.O. B. 31878, Lusaka;  
tel. 218511/218701

**Zimbabwe:** Philips Electrical (Pvt) Ltd.,  
62 Mutare Road, P.O. Box 994, Harare,  
tel. 47211/48031

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PHILIPS Concern Service  
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Tel. 31-40-735556 — Telex 35000 PHTC-NL

For information on change of address:  
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Scientific and Industrial Equipment Division,  
Test and Measurement, Building TQ 111-4, P.O. Box 218,  
5600 MD Eindhoven - The Netherlands  
Tel. 31-40-784506

For countries not listed here:  
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Test and Measurement, Building HBS, P.O. Box 218,  
5600 MD Eindhoven - The Netherlands;  
Tel. 31-40-755546